REMARKS

Applicants appreciate the time taken by the Examiner to review Applicants' present application. This application has been carefully reviewed in light of the Official Action mailed November 10, 2005. Applicants respectfully request reconsideration and favorable action in this case.

Rejections under 35 U.S.C. § 103

Claim 1 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Nikoonahad in view of Heon et al. (U.S. Patent No. 5,137,361). The Examiner states:

> Nikoonahad et al. (Nikoonahad hereinafter) show a non-contact system for measuring film thickness comprising (e.g. Figure 2, column 4, lines 8-60):
>
> directing a first pulsed laser beam to illuminate a portion of a surface of the remote target with an optical assembly;
>
> generating ultrasonic surface displacements within the illuminated portion of the surface of the remote target with the first pulsed laser beam;
>
> directing a second pulsed laser beam substantially to the illuminated portion of the surface of the remote target, wherein the first pulsed laser beam and second pulsed laser beam are directed to the surface of the remote target;
>
> detecting, using the second pulsed laser beam coaxial with first pulsed laser beam, the ultrasonic surface displacements substantially within the illuminated portion of the surface of the remote target;
>
> collecting phase modulated light from the second pulse laser beam either reflected or scattered by the remote target; and
>
> processing the phase modulated light to obtain data representative of the ultrasonic surface displacements on the surface of the remote target.
>
> Nikoonahad does not expressly show that the processing is performed with an interferometer self-stabilized with the phase modulated light.
>
> Heon et al (Heon hereinafter) show optical detection of surface motion of an object wherein the processing is performed with an interferometer self-stabilized with the phase modulated light (Heon shows a single detector can be

used for the stabilization detector and the signal detector, column 4, lines 66+). At the time of the invention, one of ordinary skill in the art would have modified Nikoonahad to use a self-stabilized interferometer in order to avoid the drawback of having to locate the laser in the immediate vicinity of the receiving interferometer (Heon, column 1, lines 40+.

Applicants respectfully submit that there is no motivation, teaching or suggestion to combine Nikoonahad and Heon. Therefore, the rejection on a combination of these references is inappropriate. Withdrawal of the rejection allowance of Claim 1 and Claims 2 and 3 which depend from Claim 1 is respectfully requested.

Applicants further submit that neither Nikoonahad and Heon alone nor the combination of these teaches or suggests make obvious the invention recited in Claim1 because the cited references fail to depict a self stabilized interferometer. Therefore, the cited prior art teaches away from the Applicant's invention and fails to mention any such arrangement. Thus, the instant invention as claimed provides a significant advantage over the prior art.

The applicant respectfully submits that neitherNikoonahad nor Heon are self stabilized.as is taught in the present invention. Heon uses a beam splitter 15 to remove a portion of the scattered phase modulated light from that light which is to be provided to the interferometer. Thus, Heon provides an interferometer that is stabilized with the scattered light but not self stabilized. Applicants' invention is stabilized using only the phase modulated light collected by the collection optics. (10/634,342, Page 19, lines 25-29) This increases the over all signal-to-noise ratio (SNR) of the output signal of the interferometer by eliminating the need for a portion of the detection signal to be used to stabilize the interferometer. Heon diverts a portion of the detection signal from the interferometer and thus can be distinguished from the instant application.

Applicants, therefore, respectfully request the Examiner to reconsider and withdraw the rejection to allow Claim 1.

Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nikoonahad and Heon as applied to claim 1 above and further in view of Schultz et al (US 5,402,223).

Nikoonahad does not show the converting of the analog signals to digital signals. Schultz et al show a furnace control system using an interferometer

comprising of converting the detection signals from analog to digital signals. At the time of the invention, one of ordinary skill in the art would have converted the analog signals to digital signals in order to electronically analyze the signals by a computer.

Applicants respectfully submit that there is no motivation, teaching or suggestion to combine Nikoonahad, Heon, and Schultz. Therefore, the rejection on a combination of these references is inappropriate. Withdrawal of the rejection allowance of Claims 2 and 3 is respectfully requested.

Applicants further submit that neither Nikoonahad, Heon, and Schultz alone nor the combination of these teaches or suggests make obvious the invention recited in Claim 2 and 3 because the cited references fail to depict a generation laser beam and detection laser beam that share a common optical path. The invention, as claimed in amended Claim1 from which Claims 2 and 3 depend, require that the first and second beam illuminate substantially the same location on the surface. Additionally, these Claims require that the interferometer be self-stabilized. These rquirements are not taught within the above cited prior art. Schultz teaches a furnace controller that converts analog to digital signals. Therefore, the cited prior art teaches away from the Applicant's invention and fails to mention any such arrangement. This arrangement allows Applicants' invention to "not require access to both sides." (10/634,342, Page 7, Lines 22-24) Thus providing a significant advantage over the prior art.

Applicants, therefore, respectfully request the Examiner to reconsider and withdraw the rejection to allow Claims 2 and 3.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nikoonahad and Heon as applied to claim 1 above, and further in view of Maris (6,008,906).

Nikoonahad shows all the claimed elements but does not show a scanning optical assembly. Maris teaches that a scanning assembly (head) can be used for scanning large objects (column 9, lines 57+). At the time of the invention, one of ordinary skill in the are would have been motivated to use a scanning optical assembly in order to be able to scan large objects.

Applicants respectfully traverses the examiners arguments relating to the combination Nikoonahad and Heon; and repeats the arguments regarding Nikoonahad and Heon as stated

above . Therefore, the rejection on a combinationof these references is inappropriate. Applicant submit that there is no motivation, teaching or suggestion to combine Nikoonahad and Heon with Maris. Therefore, the rejection on a combination of these references is inappropriate. Withdrawal of the rejection allowance of Claim 4 is respectfully requested.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nikoonahad, Heon, and Maris '906 as applied to claim 4 above, further in view of Siu et al (6,181,431).

> Nikoonahad does not expressly show the intensity controller. Siu et al show ultrasonic evaluation system comprising a controlled pulsed laser. At the time of the invention, one of ordinary skill in the art would have used a controller for the laser in order to control the magnitude and pulse of the laser.

Applicants respectfully traverses the examiners arguments relating to the combination Nikoonahad and Heon; and repeats the arguments regarding Nikoonahad and Heon as stated above . Therefore, the rejection on a combinationof these references is inappropriate. Applicant submit that there is no motivation, teaching or suggestion to combine Nikoonahad, Heon and Maris with Siu. Therefore, the rejection on a combination of these references is inappropriate. Withdrawal of the rejection allowance of Claim 5 is respectfully requested.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nikoonahad, Heon, and Maris '906 as applied to claim 4 above, further in view of Maris (5,706,094).

> Nikoonahad does not expressly show the wavelength of the laser beam. Maris shows an ultrafast optical technique for the characterization of altered materials comprising of a pulsed laser source having a wavelength of about 10 microns. At the time of the invention, one of ordinary skill in the art would have used a pulsed laser having a wavelengthof about 10 microns since Nikoonahad is silent about the wavelength arid Maris suggests that the wavelength should be about 10 microns.

Applicants respectfully traverses the examiners arguments relating to the combination Nikoonahad and Heon; and repeats the arguments regarding Nikoonahad and Heon as stated above . Therefore, the rejection on a combinationof these references is inappropriate. Applicant submit that there is no motivation, teaching or suggestion to combine Nikoonahad, Heon and

Maris with Maris '094. Therefore, the rejection on a combination of these references is inappropriate. Withdrawal of the rejection allowance of Claim 6 is respectfully requested.

Further, Maris teaches an ultrafast optical technique for the characterization of altered semiconductor samples with implanted species. This depends on "change in reflected intensity; (b) a change in transmitted intensity; (c) a change in a polarization state of the reflected and/or transmitted light; (d) a change in the optical phase of the reflected and/or transmitted light; (e) a change in direction of the reflected and/or transmitted light; and (f) a change in optical path length between the sample's surface and a detector." (Maris, Abstract)

Maris teaches the use of a wavelength of light to measure whether chemical species have been implanted within the sample. Maris examines the presence or absence of implant-related damage. One would not apply such teachings to the assessment of the internal structure of composite materials.

Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nikoonahad, Heon, and Maris as applied to claim 4 above, and further in view of Monchalin et al (US 5,080,491).

> Nikoonahad and Maris show all the elements but does not show the stabilization using the light from the target. Monchalin et al (Monchalin hereinafter) show for example in Figure 6, the stabilization using the light from the target. At the time of the invention, one of ordinary skill in the art would have modified Nikoonahad and Maris to use the stabilization method of Monchalin in order to allow ultrasound detection that is immune from intensity fluctuations of the laser and perturbations on the object surface (Abstract).

Applicants respectfully traverses the examiners arguments relating to the combination of Nikoonahad and Heon; and repeats the arguments regarding Nikoonahad and Heon as stated above . Therefore, the rejection on a combinationof these references is inappropriate. Applicant submit that there is no motivation, teaching or suggestion to combine Nikoonahad and Heon with Maris. Therefore, the rejection on a combination of these references is inappropriate. Withdrawal of the rejection allowance of Claim 7 and 8 is respectfully requested.

Applicants respectfully submit that Monchalin fails to:

> "provide the ability to perform with high signal-to-noise-ratios (SNR) at large distances from typically very dark composite materials using small aperture high-speed optical scanning methods. The ability to operate in such a mode has the distinct advantage of increasing the optical scan area coverage and providing substantially improved depth-of-field thereby eliminating the need for active focusing mechanisms.
>
> [Monchalin does] not posses the desirable feature of removing common-mode noise from the laser signals using a fully self-referenced interferometric configuration that uses all of the available light without the use of separate stabilization measurements.
>
> Another limitation associated with ... Monchalin and other known apparatuses relates to their inability to operate at very high scan rates and process ultrasonic data in real-time. This limitation makes such apparatuses only marginally useful for testing and evaluating composite materials." (10/634,342, Page 4., Line 8 – Page 5, Line 13)

Additionally, Monchalin uses a portion of the detection laser to stabilize the interferometer. Applicants' invention is stabilized using only the phase modulated light collected by the collection optics. (10/634,342, Page 19, lines 25-29) This increases the over all signal-to-noise ratio (SNR) of the output signal of the interferometer by eliminating the need for a portion of the detection signal to be used to stabilize the interferometer.

Applicants, therefore, respectfully request the Examiner to reconsider and withdraw the rejection to allow Claims 7 and 8.

Claims 9,11-13,15,17, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Monchalin in view of Maris (6,008,906) and Heon.

> Monchalin shows a laser optical ultrasound detection using two interferometers comprising:
>
> a detection laser to generate a pulsed laser beam to detect the ultrasonic surface
>
> displacements on the surface of the remote target; collection optics for collecting phase

modulated light from the pulsed laser beam either reflected or scattered by the remote target;

an interferometer to process the phase modulated light collected by the collection optics, wherein

the interferometer is stabilized with the collected phase modulated light either reflected or

scattered by the remote target (figure 6); said interferometer comprising:

a first cavity (97) having a first confocal lens structure; a second cavity (99) having a second confocal lens structure; a device (91,93) for dividing incoming depolarized light into a first polarized light component and a second polarized light component wherein said device also directs said first and second polarized light components into the first and second cavities;

a control system (117, 119) to adjust said first and second cavities such that a ratio of light transmitted through each cavity to light reflected back through each cavity remains substantially constant.

Monchalin does not expressly show the processor but shows the light transmitted through the first cavity, the light reflected back through the first cavity, the light transmitted through the second cavity, and the light reflected back through the second cavity, all in order to obtain data representative of the ultrasonic surface displacements on the surface of the remote target. Processors are well known and at the time of the invention, one of ordinary skill in the art would have used a processor to analyze the signals.

Monchalin shows all the claimed elements but does not show a scanning optical assembly. Maris '906 teaches that a scanning assembly (head) can be used for scanning large objects (column 9, lines 57+). At the time of the invention, one of ordinary skill in the are would have been motivated to use a scanning optical assembly in order to be able to scan large objects.

Monchalin also does not expressly show that the processing is performed with an interferometer self-stabilized with the phase modulated light.

Heon shows optical detection of surface motion of an object wherein the processing is performed with an interferometer self-stabilized with the phase modulated light (Heon shows a single detector can be used for the stabilization detector and the signal detector, column 4, lines 66+). At the time of the invention, one of ordinary skill in the art would have modified Nikoonahad to use a self-stabilized interferometer in order to avoid the drawback of having to locate the laser in the immediate vicinity of the receiving interferometer (Heon, column 1, lines 40+.

With regards to the moving of the laser or the sample of claims 11,12, and 17, it is well known to move either the sample or the target in order to scan the sample completely rather than just a single spot, and one of ordinary skill would have done so in order to evaluate the whole sample.

Applicants respectfully submit that Monchalin fails to:

> "provide the ability to perform with high signal-to-noise-ratios (SNR) at large distances from typically very dark composite materials using small aperture high-speed optical scanning methods. The ability to operate in such a mode has the distinct advantage of increasing the optical scan area coverage and providing substantially improved depth-of-field thereby eliminating the need for active focusing mechanisms.
>
> [Monchalin does] not posses the desirable feature of removing common-mode noise from the laser signals using a fully self-referenced interferometric configuration that uses all of the available light without the use of separate stabilization measurements.
>
> Another limitation associated with ... Monchalin and other known apparatuses relates to their inability to operate at very high scan rates and process ultrasonic data in real-time. This limitation makes such apparatuses only marginally useful for testing and evaluating composite materials." (10/634,342, Page 4., Line 8 – Page 5, Line 13)

Additionally, Monchalin uses a portion of the detection laser to stabilize the interferometer. Applicants' invention is stabilized using only the phase modulated light collected by the collection optics. (10/634,342, Page 19, lines 25-29) This increases the over all signal-to-noise ratio (SNR) of the output signal of the interferometer by eliminating the need for a portion of the detection signal to be used to stabilize the interferometer.

Applicants respectfully submit that the scanning assembly facilitates high-speed optical scanning which Monchalin is incapable of. Applicants respectfully traverse the examiners assertion that "the moving of the laser or the sample of claims 11, 12, and 17, it is well known to move either the sample or the target in order to scan the sample completely rather than just a single spot, and one of ordinary skill would have done so in order to evaluate the whole sample." The scanning assembly redirects the laser to scan the sample spot across the target. This method does not involve the repositioning of the laser or sample but rather the redirection of the laser beam. This scanning ability is augmented with the positioning apparatus to facilitate high-speed optical scanning.

Applicants, therefore, respectfully request the Examiner to reconsider and withdraw the rejection to allow Claims 9,11-13,15,17, and 18.

Claims 10 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Monchalin, Maris '906, and Heon as applied to claim 9 and 15 above, further in view of Siu et al.

> Monchalin does not expressly show the intensity controller. Siu et al show ultrasonic evaluation system comprising a controlled pulsed laser. At the time of the invention, one of ordinary skill in the art would have used a controller for the laser in order to control the magnitude and pulse of the laser.

Applicants respectfully traverses the examiners arguments relating to Monchalin and Heon; and repeats the arguments regarding Monchalinand Heon as stated above . Therefore, the rejection on a combination of these references is inappropriate. Applicant submit that there is no motivation, teaching or suggestion to combine Monchalin, Maris '906, and Heon with Siu et al. Therefore, the rejection on a combination of these references is inappropriate. Withdrawal of the rejection allowance of Claim 10 and 16 is respectfully requested.

Applicants respectfully submit that Monchalin fails to:

> "provide the ability to perform with high signal-to-noise-ratios (SNR) at large distances from typically very dark composite materials using small

> aperture high-speed optical scanning methods. The ability to operate in such a mode has the distinct advantage of increasing the optical scan area coverage and providing substantially improved depth-of-field thereby eliminating the need for active focusing mechanisms.
>
> [Monchalin does] not posses the desirable feature of removing common-mode noise from the laser signals using a fully self-referenced interferometric configuration that uses all of the available light without the use of separate stabilization measurements.
>
> Another limitation associated with ... Monchalin and other known apparatuses relates to their inability to operate at very high scan rates and process ultrasonic data in real-time. This limitation makes such apparatuses only marginally useful for testing and evaluating composite materials." (10/634,342, Page 4., Line 8 – Page 5, Line 13)

Additionally, Monchalin uses a portion of the detection laser to stabilize the interferometer. Applicants' invention is stabilized using only the phase modulated light collected by the collection optics. (10/634,342, Page 19, lines 25-29) This increases the over all signal-to-noise ratio (SNR) of the output signal of the interferometer by eliminating the need for a portion of the detection signal to be used to stabilize the interferometer.

Applicants, therefore, respectfully request the Examiner to reconsider and withdraw the rejection to allow Claims 10 and 16.

Claims 14 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over White et al (US 6,128,081) in view of Monchalin, Maris '906, and Heon.

> White et al show a method and system for measuring a physical parameter wherein the generation laser and the detection laser coaxially apply laser beams to the surface of the remote target. White et al does not show the interferometer comprising: a first cavity (97) having a first confocal lens structure; a second cavity (99) having a second confocal lens structure; a device (91,93) for dividing incoming de-polarized light into a first polarized light component and a second polarized light component wherein said device also directs said first and second polarized light components into the first and second cavities.

Monchalin shows an interferometer (for example in Figure 6) used for measuring the surface characteristics comprising: an interferometer to process the phase modulated light collected by the collection optics; said interferometer comprising: a first cavity (97) having a first confocal lens structure; a second cavity (99) having a second confocal lens structure; a device (91,93) for dividing incoming de-polarized light into a first polarized light component and a second polarized light component wherein said device also directs said first and second polarized light components into the first and second cavities; a control system (117,119) to adjust said first and second cavities such that a ratio of light transmitted through each cavity to light reflected back through each cavity remains substantially constant.

Monchalin does not expressly show the process but shows the light transmitted through the first cavity, the light reflected back through the first cavity, the light transmitted through the second cavity, and the light retlected back through the second cavity, all in order to obtain data representative of the ultrasonic surface displacements on the surface of the remote target. Processors are well known and at the time of the invention, one of ordinary skill in the art would have used a processor to analyze the signals.

At the time of the invention, one of ordinary skill in the art would have modified White et al to use the interferometer of Monchalin in order to allow ultrasound detection that is immune from intensity fluctuations of the laser and perturbations on the object surface (Abstract).

Maris teaches that a scanning assembly (head) can be used for scanning large objects (column 9, lines 57+). At the time of the invention, one of ordinary skill in the art would have been motivated to use a scanning optical assembly in order to be able to scan large objects.

White does not expressly show that the processing is performed with an interferometer self-stabilized with the phase modulated light.

Heon shows optical detection of surface motion of an object wherein the processing is performed with an interferometer self-stabilized with the phase

modulated light (Heon shows a single detector can be used for the stabilization detector and the signal detector, column 4, lines 66+). At the time of the invention, one of ordinary skill in the art would have modified Nikoonahad to use a self-stabilized interferometer in order to avoid the drawback of having to locate the laser in the immediate vicinity of the receiving interferometer (Heon, column 1, lines 40+.

Applicants respectfully traverses the examiners arguments relating to Monchalin and Heon; and repeats the arguments regarding Monchalinand Heon as stated above . Therefore, the rejection on a combination of these references is inappropriate. Applicant submit that there is no motivation, teaching or suggestion to combine Monchalin, Maris '906, and Heon with Siu et al. Therefore, the rejection on a combination of these references is inappropriate. Withdrawal of the rejection allowance of Claim 14 and 19 is respectfully requested.

Applicants respectfully submit that Monchalin fails to:

> "provide the ability to perform with high signal-to-noise-ratios (SNR) at large distances from typically very dark composite materials using small aperture high-speed optical scanning methods. The ability to operate in such a mode has the distinct advantage of increasing the optical scan area coverage and providing substantially improved depth-of-field thereby eliminating the need for active focusing mechanisms.
>
> [Monchalin does] not posses the desirable feature of removing common-mode noise from the laser signals using a fully self-referenced interferometric configuration that uses all of the available light without the use of separate stabilization measurements.
>
> Another limitation associated with ... Monchalin and other known apparatuses relates to their inability to operate at very high scan rates and process ultrasonic data in real-time. This limitation makes such apparatuses only marginally useful for testing and evaluating composite materials." (10/634,342, Page 4., Line 8 – Page 5, Line 13)

Additionally, Monchalin uses a portion of the detection laser to stabilize the interferometer. Applicants' invention is stabilized using only the phase modulated light collected by the collection optics. (10/634,342, Page 19, lines 25-29) This increases the over all signal-to-noise ratio (SNR) of the output signal of the interferometer by eliminating the need for a portion of the detection signal to be used to stabilize the interferometer.

Applicants, therefore, respectfully request the Examiner to reconsider and withdraw the rejection to allow Claims 14 and 19.

Applicant respectfully points out that in order to combine references for an obviousness rejection, there must be some teaching, suggestion or incentives supporting the combination. *In re Laskowski*, 871 F.2d 115, 117, 10 U.S.P.Q. 2d 1397, 1399 (Fed. Cir. 1989). The mere fact that the prior art could be modified does not make that modification obvious unless the prior art suggests the desirability of the modification. *In re Gordon*, 733 F.2d 900, 902, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984). In addition, it is wellestablished that Applicant's disclosure cannot be used to reconstruct Applicant's invention from individual pieces found in separate, isolated references. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596 (Fed. Cir. 1988).

CONCLUSION

Applicant has now made an earnest attempt to place this case in condition for allowance. For the foregoing reasons and for other reasons clearly apparent, Applicant respectfully requests full allowance of Claims 1-19.

An extension of three (3) months is requested under 37 C.F.R. § 1.136 with the appropriate fee attached.

While Applicants believe no fee is due with this transmission, if any fees are due, the Commissioner is hereby authorized to charge Deposit Account No. 50-2216 of Garlick Harrison Markison LLP.

Respectfully submitted,
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